

## We Claim:

1. A structure for providing light, comprising:
  - a substrate;
  - 5 an amorphous oxide material overlying the substrate;
  - a monocrystalline perovskite oxide material overlying the amorphous oxide material;
  - a monocrystalline compound semiconductor material overlying the monocrystalline perovskite oxide material;
  - 10 a photovoltaic device formed using the monocrystalline compound semiconductor material; and
  - a light-emitting semiconductor component formed using the monocrystalline compound semiconductor material and responsive to electrical energy produced by the photovoltaic device.
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2. The structure of claim 1, further comprising:
  - a diffuser formed over the light-emitting semiconductor component.
3. The structure of claim 1, wherein the light-emitting semiconductor component is  
20 selected from the group consisting of a light emitting diode (LED) and a vertical cavity surface emitting laser (VCSEL).
4. The structure of claim 1, wherein the substrate includes:
  - a glass substrate; and
  - 25 a monocrystalline silicon layer overlying the glass substrate.
5. The structure of claim 4, further comprising:
  - a thermal oxide layer between the glass substrate and the monocrystalline silicon layer.
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6. The structure of claim 4, wherein the monocrystalline silicon layer is formed on the glass substrate using a lateral solidification technique.

7. A liquid crystal display (LCD), comprising:

- 5 a first polarizer;  
a liquid crystal (LC) panel placed behind the first polarizer;  
a second polarizer behind the LC panel;  
a bandpass reflector, placed behind the second polarizer, for permitting light to pass therethrough; and

10 a back-lighting panel placed behind the bandpass reflector comprising at least one photovoltaic device for producing electric energy in response to the light, and at least one light-emitting component responsive to the electric energy produced by the at least one photovoltaic device.

15 8. The LCD of claim 7, wherein the back-lighting panel further includes:

- a substrate;  
an amorphous oxide material overlying the substrate;  
a monocrystalline perovskite oxide material overlying the amorphous oxide material; and

20 a monocrystalline compound semiconductor material overlying the monocrystalline perovskite oxide material;

wherein the at least one photovoltaic device and the at least one light-emitting semiconductor component are formed using the monocrystalline compound semiconductor material.

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9. The LCD of claim 8, wherein the substrate includes:

- a glass substrate; and  
a monocrystalline silicon layer overlying the glass substrate.

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15. A process for fabricating a semiconductor structure, comprising:  
providing a substrate;  
depositing a monocrystalline perovskite oxide film overlying the substrate, the  
5 film having a thickness less than a thickness of the material that would result in strain-  
induced defects;  
forming an amorphous oxide interface layer containing at least silicon and  
oxygen at an interface between the monocrystalline perovskite oxide film and the  
substrate;  
10 epitaxially forming a monocrystalline compound semiconductor layer overlying  
the monocrystalline perovskite oxide film; and  
forming a photovoltaic device using the monocrystalline compound  
semiconductor material;  
forming a light-emitting semiconductor component using the monocrystalline  
15 compound semiconductor material.
16. The process of claim 15, further comprising:  
forming a diffuser over the light-emitting semiconductor component.
- 20 17. The process of claim 15, wherein the light-emitting semiconductor component is  
selected from the group consisting of a light emitting diode (LED) and a vertical cavity  
surface emitting laser (VCSEL).
18. The process of claim 15, wherein the step of providing the substrate includes:  
25 providing a glass substrate; and  
forming a monocrystalline silicon layer overlying the glass substrate.

19. The process of claim 18, further comprising:  
forming a thermal oxide layer between the glass substrate and the  
monocrystalline silicon layer.

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20. The process of claim 18, wherein the monocrystalline silicon layer is formed on  
the glass substrate using a lateral solidification technique.

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21. A method for manufacturing a liquid crystal display (LCD), comprising:  
providing a polarizer;  
placing a liquid crystal (LC) panel behind the polarizer;  
placing a bandpass reflector behind the LC panel, the bandpass reflector for  
permitting a predetermined amount of light to pass therethrough; and  
placing a back-lighting panel behind the bandpass reflector, the back-lighting  
panel comprising at least one photovoltaic device for producing electric energy in  
response to the predetermined amount of light, and at least one light-emitting  
component responsive to the electric energy produced by the at least one photovoltaic  
device.

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22. The method of claim 21, further comprising:  
providing a substrate;  
depositing a monocrystalline perovskite oxide film overlying the substrate, the  
5 film having a thickness less than a thickness of the material that would result in strain-  
induced defects;  
forming an amorphous oxide interface layer containing at least silicon and  
oxygen at an interface between the monocrystalline perovskite oxide film and the  
substrate;  
10 epitaxially forming a monocrystalline compound semiconductor layer overlying  
the monocrystalline perovskite oxide film; and  
forming the at least one photovoltaic device using the monocrystalline  
compound semiconductor material; and  
forming the at least one light-emitting component using the monocrystalline  
15 compound semiconductor material
23. The method of claim 21, further comprising:  
forming at least one diffuser over the at least one light-emitting component.
- 20 24. The method of claim 23, wherein the diffuser is a phosphor material.
25. The method of claim 21, wherein the at least one light-emitting component is  
selected from the group consisting of a light emitting diode (LED) and a vertical cavity  
surface emitting laser (VCSEL).
26. The method of claim 21, wherein the bandpass reflector is a holographic  
reflector.

27. The method of claim 21, wherein the step of providing the substrate includes:  
providing a glass substrate; and  
forming a monocrystalline silicon layer overlying the glass substrate.

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28. The method of claim 27, further comprising:  
forming a thermal oxide layer between the glass substrate and the  
monocrystalline silicon layer.

- 10 29. The method of claim 26, wherein the monocrystalline silicon layer is formed on  
the glass substrate using a lateral solidification technique.

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